

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Dimitri Papamoschou

Reissue Application No.: Unassigned

Filed: June 29, 2001

For: METHOD OF ELIMINATING MACH  
WAVES FROM SUPERSONIC JETS

Reissue of: U.S. Patent No. 5,916,127

Issued: June 29, 1999

**AMENDMENT UNDER 37 CFR §1.173(b)**

BOX REISSUE

Assistant Commissioner for Patents  
Washington, DC 20231-9999

Sir:

In accordance with 37 C.F.R. §1.173(b), Applicant respectfully submits that the proposed amendments be incorporated into the above-identified Reissue application prepared in compliance with 37 C.F.R. §1.173(a) and enclosed herewith. The proposed amendments are set forth below, which includes amendments to claims 1, 2, 5-14 and 16-19 and adds new claims 20-34.

1 1. (Amended) A jet engine [which produces a supersonic stream of air, said  
2 engine] comprising:  
3 [a structure adapted to provide a compression ratio sufficient to produce a supersonic  
4 thrust;]  
5 an air intake end [and an exhaust end] to intake air, the air being divided into at least  
6 first and second streams; and  
7 [said exhaust end having a partition that divides said exhaust end into a first side and  
8 a second side such that a first stream exits said exhaust end on said first side and a second  
9 stream of heated air exits said exhaust end on said second side, and  
10 a combustion chamber for heating adapted to heat said first stream such that said first  
11 stream is expelled from said exhaust end of said engine to produce said supersonic thrust,  
12 and]  
13 a [heating] control mechanism [adapted to heat said second stream such that said  
14 second stream is expelled from said exhaust end of said jet engine to produce a subsonic  
15 thrust adjacent to said first thrust and thereby prevent Mach waves from said supersonic  
16 thrust] to control at least one of temperature and velocity of at least one of the first and  
17 second streams to control Mach wave formation from the first stream.

1 2. (Amended) The jet engine of claim [1] 26, wherein said first and second  
2 [stream] streams pass through said combustion chamber before said partition separates said  
3 first stream from said second stream[; after said separation, said heating mechanism designed  
4 to further heat said second stream].



3 a heating mechanism adapted to heat said third stream to a temperature different from  
4 that of said second stream, such that said third stream is also expelled from said exhaust end  
5 of said jet engine to produce a third thrust adjacent to said second thrust and thereby prevent  
6 Mach waves from said second thrust] control mechanism controls at least one of temperature  
7 and velocity of a third stream to control Mach wave formation from the second stream, the  
8 third stream being divided from the air.

1 12. (Amended) The jet engine of claim [1] 25, wherein said first stream has a  
2 circular or elliptical cross section at a plane, said plane located at said exhaust end [of said jet  
3 engine].

1 13. (Amended) The jet engine of claim [1] 25, wherein said first stream has a  
2 rectangular cross section at a plane located at said exhaust end [of said jet engine].

1 14. (Amended) A jet engine [in use propelling an aircraft at a supersonic speed  
2 together with the exhaust stream thereof, said engine] comprising:

3 an air intake end [and an exhaust end] to intake air, the air being divided into at least  
4 first and second streams; and

5 [a first passage and a second passage extending between said air intake end and said  
6 exhaust end;

7 a combustion chamber in fluid communication with and located along said first  
8 passage such that a portion of said first passage is disposed to receive a first flow of exhaust  
9 between said combustion chamber and said exhaust end;

10 said first flow of exhaust forming said supersonic exhaust stream upon exiting said  
11 engine;]

12 a [heating] control mechanism [in fluid communication with and located along said  
13 second passage such that a portion of said second passage is disposed to receive a second  
14 flow of exhaust between said heating mechanism and said exhaust end;

15 said second flow of exhaust forming a subsonic exhaust stream upon exiting said  
16 engine; and

17 said supersonic exhaust stream at least partially enveloped by said subsonic exhaust  
18 stream] to control at least one of temperature and velocity of at least one of the first and  
19 second streams such that the first and second streams form supersonic and subsonic streams  
20 upon exiting an exhaust end, the subsonic stream at least partially surrounding the supersonic  
21 stream.

1 16. (Amended) The jet engine of claim [14] 28, wherein said heating mechanism  
2 is a suppression burner, said suppression burner being designed to heat the air by burning a  
3 fuel.

1 17. (Amended) The jet engine of claim [14] 28, wherein said second passage  
2 substantially encloses said first passage.

1 18. (Amended) The jet engine of claim [14] 28, wherein said jet engine is at least  
2 partially surrounded by a shroud, said shroud defining an exterior wall of said second  
3 passage.

1 19. (Amended) The jet engine of claim [1] 14, wherein said first [exhaust] stream  
2 has a circular or elliptical cross section at a plane, said plane located at said exhaust end [of  
3 said engine].

1 20. (New) The jet engine of claim 1 wherein the control mechanism controls  
2 velocity of turbulent eddies of the first stream to be subsonic relative to the second stream.

1 21. (New) The jet engine of claim 1 wherein the control mechanism controls  
2 velocity of turbulent eddies of the second stream to be subsonic relative to an ambient stream.

1 22. (New) The jet engine of claim 1 wherein the control mechanism controls the  
2 temperature of the second stream to be greater than  $(B \cdot M_1 / (1 + M_2))^2 \cdot T_1$ , wherein B is a ratio  
3 between eddy velocity and stream velocity,  $M_1$  is air velocity of the first stream divided by a  
4 first speed of sound in the first stream,  $M_2$  is air velocity of the second stream divided by a  
5 second speed of sound in the second stream, and  $T_1$  is temperature of air in the first stream.

1 23. (New) The jet engine of claim 1 wherein the control mechanism controls the  
2 temperature of the second stream to be less than  $T_a \cdot ((1 + M_a) / (B \cdot M_2))^2$ , wherein B is a ratio  
3 between eddy velocity and stream velocity,  $M_a$  is air velocity of ambient air surrounding said  
4 second stream divided by ambient speed of sound,  $M_2$  is air velocity of the second stream  
5 divided by a second speed of sound in the second stream, and  $T_a$  is temperature of said  
6 ambient air surrounding said second stream.

1        24. (New) The jet engine of claim 1 wherein the control mechanism controls the  
2        temperature of the second stream to be greater than  $(B \cdot M_1 / (1 + M_2))^2 \cdot T_1$  and less than  
3         $T_a \cdot ((1 + M_a) / (B \cdot M_2))^2$ , wherein B is a ratio between eddy velocity and stream velocity,  $M_1$  is  
4        air velocity of the first stream divided by a first speed of sound in the first stream,  $M_2$  is air  
5        velocity of the second stream divided by a second speed of sound in the second stream,  $T_1$  is  
6        temperature of air in the first stream,  $T_a$  is temperature of said ambient air surrounding said  
7        second stream, and  $M_a$  is air velocity of ambient air surrounding said second stream divided  
8        by ambient speed of sound.

1        25. (New) The jet engine of claim 1 further comprising:  
2        an exhaust end having first and second sides divided by a partition to allow the first  
3        and second streams exiting on said first and second sides.

1        26. (New) The jet engine of claim 25 wherein the control mechanism comprises:  
2        a combustion chamber to heat said first stream such that said first stream is expelled  
3        from said exhaust end to produce a supersonic thrust.

1        27. (New) The jet engine of claim 25 wherein the control mechanism comprises:  
2        a heating mechanism to heat said second stream such that the velocity of the turbulent  
3        eddies of the second stream is subsonic relative to the ambient stream.

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1        28. (New) The jet engine of claim 14 wherein the control mechanism comprises:  
2        a combustion chamber located along a first passage such that a portion of said first  
3        passage is disposed to receive a first flow between said combustion chamber and said exhaust  
4        end, the first flow forming said supersonic stream; and  
5        a heating mechanism located along a second passage such that a portion of said  
6        second passage is disposed to receive a second flow between said heating mechanism and  
7        said exhaust end, said second flow forming the subsonic stream.

1        29. (New) A method comprising:  
2        intaking air into an intake end of a jet engine, the air being divided into at least first  
3        and second streams; and  
4        controlling at least one of temperature and velocity of the first and second streams to  
5        control Mach wave formation from the first stream.

1        30. (New) The method of claim 29 wherein controlling comprises:  
2        controlling velocity of turbulent eddies of the first stream to be subsonic relative to  
3        the second stream.

1        31. (New) The method of claim 29 wherein controlling comprises:  
2        controlling velocity of turbulent eddies of the second stream to be subsonic relative to  
3        an ambient stream.



32. (New) The method of claim 29 wherein controlling comprises:

controlling the temperature of the second stream to be greater than

$(B \cdot M_1 / (1 + M_2))^2 \cdot T_1$ , wherein B is a ratio between eddy velocity and stream velocity,  $M_1$  is air velocity of the first stream divided by a first speed of sound in the first stream,  $M_2$  is air velocity of the second stream divided by a second speed of sound in the second stream, and  $T_1$  is temperature of air in the first stream.

33. (New) The method of claim 29 wherein controlling comprises:

controlling the temperature of the second stream to be less than  $T_a \cdot ((1 + M_a) / (B \cdot M_2))^2$ ,

wherein B is a ratio between eddy velocity and stream velocity,  $M_a$  is air velocity of ambient air surrounding said second stream divided by ambient speed of sound,  $M_2$  is air velocity of the second stream divided by a second speed of sound in the second stream, and  $T_a$  is temperature of said ambient air surrounding said second stream.

34. (New) The method of claim 29 wherein controlling comprises:

controlling the temperature of the second stream to be greater than

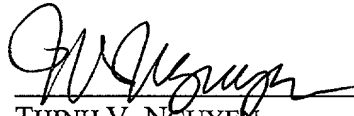
$(B \cdot M_1 / (1 + M_2))^2 \cdot T_1$  and less than  $T_a \cdot ((1 + M_a) / (B \cdot M_2))^2$ , wherein B is a ratio between eddy velocity and stream velocity,  $M_1$  is air velocity of the first stream divided by a first speed of sound in the first stream,  $M_2$  is air velocity of the second stream divided by a second speed of sound in the second stream,  $T_1$  is temperature of air in the first stream,  $T_a$  is temperature of said ambient air surrounding said second stream, and  $M_a$  is air velocity of ambient air surrounding said second stream divided by ambient speed of sound.

CONCLUSION

In accordance with 37 CFR §1.173(b), Applicant respectfully submits herewith the proposed amendments for incorporation into the above-identified reissue application. Reconsideration of pending claims 1-34 is respectfully requested.

Respectfully submitted,

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THINH V. NGUYEN

Reg. No. 42,034

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**STATEMENT OF STATUS/SUPPORT FOR CLAIM CHANGES**

BOX REISSUE

Assistant Commissioner for Patents  
Washington, DC 20231-9999

Sir:

In accordance with 37 C.F.R. §1.173(c), claims 1-34 are now pending. Support in the disclosure of the patent for amended claims 1, 2, 5-14 and 16-19 and newly added claims 20-34 is listed below.

Claim Number	Support in Disclosure
Claim 1	Col. 5 (lines 4-7, 40-43, 53-57); Col. 9 (lines 61-62); Col. 10 (lines 35-39)
Claim 2	Col. 8 (lines 14-26)

Claim 5	Change claim dependency
Claim 6	Change claim dependency and remove redundant phrase
Claim 7	Change claim dependency
Claim 8	Change claim dependency and correct typographical error
Claim 9	Remove redundant words
Claim 10	Correct minor informalities
Claim 11	Col. 10 (lines 15-24)
Claim 12	Change claim dependency and remove redundant phrase
Claim 13	Change claim dependency and remove redundant phrase
Claim 14	Col. 5 (lines 4-7, 40-43, 53-57)
Claim 16	Change claim dependency
Claim 17	Change claim dependency
Claim 18	Change claim dependency
Claim 19	Change claim dependency and remove redundant phrase
Claim 20	Col. 5 (lines 53-55)
Claim 21	Col. 5 (lines 55-57)
Claim 22	Col. 7 (lines 1-31)
Claim 23	Col. 7 (lines 1-31)
Claim 24	Col. 7 (lines 1-31)
Claim 25	Original Claim 1
Claim 26	Original Claim 1
Claim 27	Original Claim 1
Claim 28	Original Claim 14
Claim 29	Col. 5 (lines 4-7, 40-43, 53-57); Col. 9 (lines 61-62); Col. 10 (lines 35-39)
Claim 30	Col. 5 (lines 53-55)
Claim 31	Col. 5 (lines 55-57)

Claim 32	Col. 7 (lines 1-31)
Claim 33	Col. 7 (lines 1-31)
Claim 34	Col. 7 (lines 1-31)

### CONCLUSION

In light of the foregoing, Applicant respectfully submits that no new substantive matter has been added and respectfully requests consideration of all pending claims.

Respectfully submitted,

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